INTI International University Campus (INTI-IU) Security Monitoring System With Face Recognition Technology

Yap Choi Sen[1], Yew Zheng Han[1] and Chong Fong Kim[1]

[1]Faculty of Information Technology, INTI International University,
Persiaran Perdana BBN, Putra Nilai,
71800 Nilai, Negeri Sembilan, Malaysia

Corresponding Author: choisen.yap@newinti.edu.my

Abstract

The study is based on the stealing case happened at INTI International University Campus (INTI-IU) where student lost their personal belongings such as laptop, bag, smartphone, and wallet in the campus. When the case was reported, the INTI-IU security department has referred to the closed-circuit television (CCTV) records to trace the suspect but the footage was too grainy to make out the person's identity. The tracing process is time-consuming and not effective, and always ended with unclosed cases. The author is proposing a campus security monitory system with face recognition technology to identify the unauthorized person who has entered the campus illegally. Once the stranger is identified, the security department will be alert immediately for further action. This will tighten the security on campus and provide a safer place for the staff and students.

Keywords

Secure Campus, Face Recognition, Real-Time Alert

Introduction

INTI-IU students have been complaining and reported to the campus security department about item lost cases, which took place during the examination time. The student has only realized his personal items such as laptop, bag, wallet, and other personal belongings were missing after the examination ended. When the case was reported to the security department, the authorize staff asked for the details such as the date and time when it was happened to start the tracing by playback the CCTV records accordingly. The process is time-consuming and not effective, and always ended with an unclosed case due to the poor footprints capture by the CCTV. The author has interviewed Mr. Nedan, the head of the INTI-IU Security department, to find out the challenges faced by his team. There are few issues brought out by Mr. Nedan, such as the shortage of man-power in taking care of every corner of the campus; students do not cooperate when asked to identify themselves before entering the campus. Another issue was highlighted on the careless attitude which causes the students to be targeted by the theft. Similar cases were reported at other universities where the victims lost their personal belonging on the campus when they were on duty or in the class (Rajaendram, 2020). The increasing severity of campus theft has brought the author's concerns about on-campus security, which would affect the

International Conference on Innovation and Technopreneurship 2020
Submission: 4 September 2020
Acceptance: 27 October 2020
©INTI International University 2020

students from choosing to attend the class up to the way the students spend time while on the campus. Therefore the author has proposed to develop a face recognition system to detect an identity with a camera, which will map the facial features from a photograph or video, and compares the captured information with a database of known faces to find a match.

Methodology

The face recognition system has the ability to work with images and videos and is able to work with faces from different angles. The system is capable to verify a person by comparing and analyzing the image patterns based on the person's facial contours, which including face detection, feature extraction, and face recognition functions (figure 1). During the face detection stage, the system will determine the image captured contains a human face or others. The next process is to extract facial features such as mouth, nose, and eyes to identify a human identity. The extracted result will then compare to the faces stored in the database for the identification and verification process.

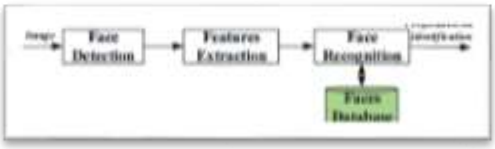

Figure 1: Face recognition structure

The authorized security department staff needs to login to the system to register a visitor who has requested permission to visit the campus. A camera is used to capture the visitor's face image where the physical image will store in the database. Once the registration is succeeded, the visitor is classified as an "authorized" visitor when they enter the compound of CCTV control, any unauthorized face detected by the system will be recorded as "stranger" to alert the security staff for further actions (figure 2). The proposed system will able to assist the security department team to consistently monitor the campus environment and reduce the risk of unauthorized break-ins (figure 3).

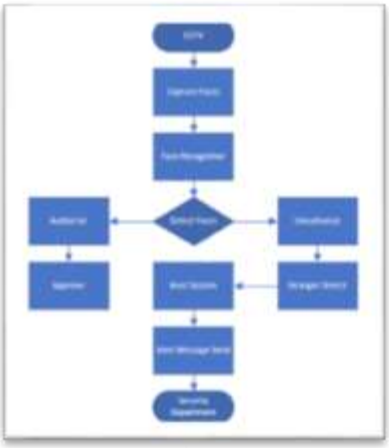

Figure 2: System Framework

International Conference on Innovation and Technopreneurship 2020
Submission: 4 September 2020
Acceptance: 27 October 2020
©INTI International University 2020

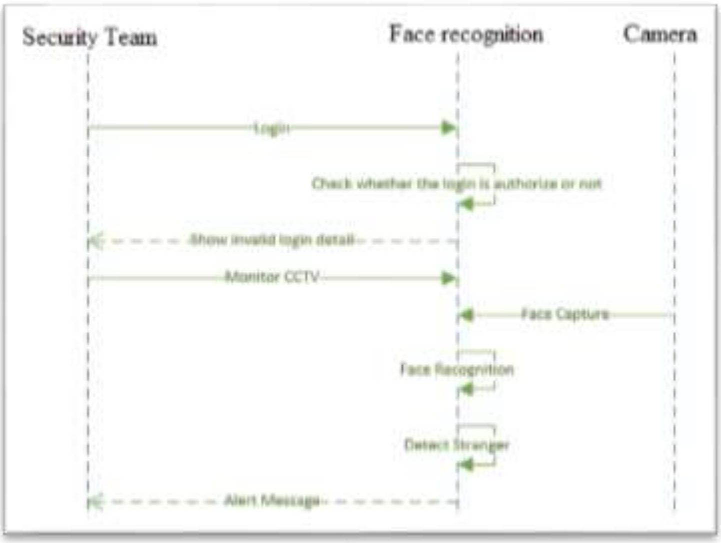

Figure 3: Sequence Diagram

Results and Discussion

The face recognition system is developed using Python programming language and the Open CV libraries. The system is required the security team to login in to registering a visitor and update the dataset to complete the image capturing process. The dataset of each registered visitor will be created with 150 face images captured within a minute and store together with their contact details in the SQLite database (figure 4). Besides, the author has developed the system by including the Haar Cascade Classifier. The Haar Cascade function is a pre-trained model located in the data folder in the Open CV, an effective object detection method trained from a lot of positive and negative images. It is a machine learning-based approach which has a huge individual ".xml" files that corresponding to a specific type of use case has been chosen by the author to train the proposed system in detecting the authorized visitor from illegal break-ins.

Figure 4: Sample Dataset

A successfully registered visitor will be detected by the system with the registered name display beside their face (figure 5), any unrecognized face will be categorized as a “stranger” which will notify the security department team for immediate actions.

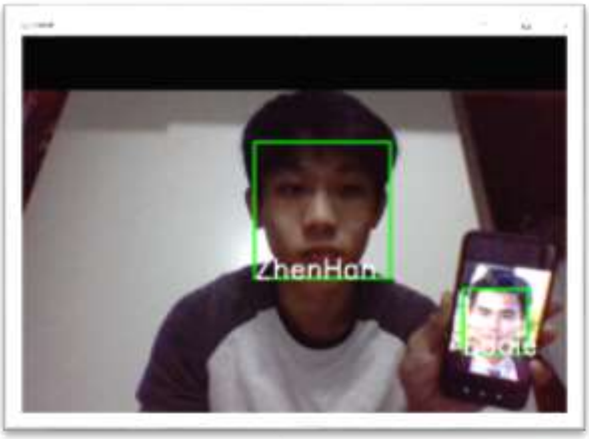

Figure 5: Sample of Authorized Visitors

Conclusions

Testing has been conducted where the system is able to detect the faces up to two objects due to the current prototype is capturing the photo with webcam. Although the system has successfully detected and recognized an authorized visitor from an illegal instructor, due to insufficient amount to datasets that have been created in the training state, the system is not always able to differentiate two similar faces captured by the camera. Also, the lighting conditions and facial expressions are also affecting the accuracy of the outcomes. The next challenge is to obtain a significantly larger dataset of the campus users by including the academic and non-academic staff, and the students' record to the system which would take-up time to complete. The author believes the named limitation can be improved by replacing the webcam with higher resolution cameras and better computer hardware and system.

References

Rajaendram, R. (2020). We’ve been burgled. Retrieved 19 May 2020, from https://www.thestar.com.my/news/education/2020/04/12/weve-been-burgled

Facial recognition in 2020 (7 trends to watch). (2020). Retrieved 10 Jun 2020, from https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/biometrics/facial-recognition

Can a Computer Recognize You? Learn How Face Scan Technology Works. (2020). Retrieved 6 Jun 2020, from https://www.lifewire.com/how-does-a-computer-recognize-your-face-4154178

Face-Recognition Using OpenCV: A step-by-step guide to build a facial recognition system | Hacker Noon. (2020). Retrieved 29 Jun 2020, from https://hackernoon.com/face-recognition-using-opencv-a-step-by-step-guide-to-build-a-facial-recognition-system-8da97cd89847

The Complete Guide to Facial Recognition Technology - Panda Security. (2020). Retrieved 3 Jun 2020, from https://www.pandasecurity.com/mediacenter/panda-security/facial-recognition-technology/

Computer Vision—Detecting objects using Haar Cascade Classifier. (2020). Retrieved 30 May 2020, from https://towardsdatascience.com/computer-vision-detecting-objects-using-haar-cascade-classifier-4585472829a9

Submission: 4 September 2020
Acceptance: 27 October 2020
©INTI International University 2020